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10/630,216	07/30/2003	Ki-Ho Jung	678-1227 (P10918)	8774

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EXAMINER	
BENGHUZZI, MOHSIN M	
ART UNIT	**PAPER NUMBER**
2611	

DATE MAILED: 11/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

N

Office Action Summary	Application No.	Applicant(s)	
	10/630,216	JUNG ET AL.	
	Examiner M.B.	Art Unit	
	Mohsin (Ben) Benghuzzi	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 30 July 2003.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-18 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) 1-18 is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☒ The drawing(s) filed on 30 July 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☒ All b)☐ Some * c)☐ None of:
1.☒ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date Dec. 18, 2003.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 2, 3, 5, 6, 9, 10, 13, and 14 are objected to because of the following: The subscripts are written in a font size that is difficult to read. In particular, the i's and the 1's are indistinguishable. Any subscripts or superscripts contained in the claims must be written in a font size that is large enough to be clearly legible.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1-18 are rejected under 35 U.S.C. 101 because they are not directed to a practical application of the idea. The claims include a set of method steps or structure plus function without concluding with a practical application, i.e., without reducing PAPR.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Onggosanusi et al. (US Pub 2003/0016640) in view of Kim et al. (US Pub 2002/0172184).

Onggosanusi et al. discloses an apparatus for reducing the peak-to-average power ratio (PAPR) of a signal transmitted on N ($=2^r$) sub-carriers in a transmitting apparatus including encoders for block coding w input data, where r is a natural number more than 2, and outputting N code symbols in an orthogonal frequency division multiplexing (OFDM) mobile communication system (Paragraph 50 Lines 1-6), comprising:

a serial to parallel (S/P) converter for converting a data stream into w-(r-2) parallel data streams, where w is the length of an information word (20 in Fig. 2);

a first encoder for receiving w/2 parallel data streams of the w-(r-2) parallel data streams from the serial to parallel converter, block coding the w/2 parallel data streams, and outputting N/2 first code symbols (Paragraph 32 Lines 1-13 and 22_1 in Fig. 2);

a second encoder for receiving the parallel data streams from the serial to parallel converter not input into the first encoder and the (r-2) input operator data streams, block coding the received data streams, and outputting N/2 second code symbols.

Onggosanusi et al. does not disclose:

an input operator generator for generating (r-2) input operator data streams according to the w-(r-2) parallel data streams;

wherein the (r-2) input operator data streams make N code symbols complementary.

However, Kim et al. discloses:

an input operator generator for generating (r-2) input operator data streams according to the w-(r-2) parallel data streams (Paragraph 8 Lines 7-23; wherein, the pilot adder and pilot controller are interpreted to perform the function of the operator generator);

wherein the (r-2) input operator data streams make N code symbols complementary (Paragraph 50 Lines 8-14).

It is desirable to use in a PAPR reduction apparatus a generator for generating input operator data streams to make complementary codes. Use of complementary codes results in the cancellation of side frequencies, and thus, in the minimization of inter-symbol-interference. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a generator for generating input operator data streams to make complementary codes, as Kim et al. discloses, in order to minimize inter-symbol-interference.

6. Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (US Pub 2002/0172184) in view of Yoshida et al. (US 7,006,429).

1) Regarding claim 1:

Kim et al. discloses an apparatus for reducing the peak-to-average power ratio (PAPR) of a signal transmitted on N ($=2^r$) sub-carriers in a transmitting apparatus

including encoders for block coding w input data, where r is a natural number more than 2, and outputting N code symbols in an orthogonal frequency division multiplexing (OFDM) mobile communication system (Paragraph 50 Lines 1-6 and Abstract Lines 2-12), comprising:

a serial to parallel (S/P) converter for converting a data stream into w-(r-2) parallel data streams, where w is the length of an information word (104 in Fig. 1);

a first encoder for receiving w/2 parallel data streams of the w-(r-2) parallel data streams from the serial to parallel converter, block coding the w/2 parallel data streams, and outputting N/2 first code symbols (107 in Fig. 1 and Column 8 Lines 13-19, wherein, the sub-channel mapper is interpreted as the first encoder);

an input operator generator for generating (r-2) input operator data streams according to the w-(r-2) parallel data streams (Paragraph 8 Lines 7-23; wherein, the pilot adder and pilot controller are interpreted to perform the function of the operator generator);

wherein the (r-2) input operator data streams make N code symbols complementary (Paragraph 50 Lines 8-14).

Kim et al. does not disclose a second encoder for receiving the parallel data streams from the serial to parallel converter not input into the first encoder and the (r-2) input operator data streams, block coding the received data streams, and outputting N/2 second code symbols. However, Yoshida et al. discloses a second encoder for receiving the parallel data streams from the serial to parallel converter not input into the

first encoder and the (r-2) input operator data streams, block coding the received data streams, and outputting N/2 second code symbols (Column 12 Lines 34-40).

It is desirable that a transmitting apparatus for reducing PAPR encodes a codeword using two encoders (See Yoshida et al., Column 19 Lines 22-24). Using two encoders to encode a codeword results in a receiver with improved error detection. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a second encoder, as Yoshida et al. discloses, in the apparatus of Kim et al., in order to result in improved error detection.

2) Regarding claim 2:

Kim et al. discloses the apparatus of claim 1, wherein when the transmitting apparatus uses BPSK (Binary Phase Shift Keying), the input operator generator generates the input operator data streams by the following equation, where k represents a data stream output from the S/P converter (Paragraph 65 Lines 1-3 and Paragraphs 97, 98),

$$\mathbf{k_{2r} = -k_2 \bullet k_r \bullet k_{r+2}}$$

$$\mathbf{k_{2r-i} = k_1 \bullet k_{r-i} \bullet k_{r+1},} \qquad i = 1,\ldots,(r-3)$$

3) Regarding claim 3:

Kim et al. discloses the apparatus of claim 1, wherein when the transmitting apparatus uses QPSK (Quadrature Phase Shift Keying), the input operator generator generates the input operator data streams by the following equation, where k represents

a data stream output from the S/P converter (Paragraph 69 Lines 1-3 and Paragraphs 97, 98),

$$\mathbf{k_{b10} = k_{b1} \bullet k_{b2} \bullet k_{b3} \bullet k_{b4} \bullet k_{b7} \bullet k_{b8} \bullet k_{b9}}$$

$$\mathbf{k_{s6} = mod(mod(k_{s2} + 1,2) \times 2 + k_{s2} + k_{s3} + k_{s5},4)}$$

where mod (x, M) denotes modulo M for x.

4) Regarding claim 4:

Kim et al. teaches a method of reducing the peak-to-average power ratio (PAPR) of a signal transmitted on N ($=2^r$) sub-carriers in a transmitting apparatus including encoders for block coding w input data where r is a natural number more than 2, and outputting N code symbols in an orthogonal frequency division multiplexing (OFDM) mobile communication system (Paragraph 50 Lines 1-6 and Abstract Lines 2-12), comprising the steps of:

(1) converting a data stream into w-(r-2) parallel data streams, where w is the length of an information word (104 in Fig. 1);

(2) block coding w/2 parallel data streams of the w-(r-2) parallel data streams and outputting N/2 first code symbols (Abstract Lines 2-6,107 in Fig. 1 and Column 8 Lines 13-19, wherein, the sub-channel mapper is interpreted as the first encoder outputting first code symbols);

(3) generating (r-2) input operator data streams according to the w-(r-2) parallel data streams (Paragraph 8 Lines 7-23 and 105, 106 in Fig. 1);

wherein the (r-2) input operator data streams make N code symbols complementary (Paragraph 50 Lines 8-14).

Kim et al. does not teach:

(4) block coding the parallel data streams not subject to the block coding in step (2) and the (r-2) input operator data streams, and outputting N/2 second code symbols.

However, Yoshida et al. teaches:

(4) block coding the parallel data streams not subject to the block coding in step (2) and the (r-2) input operator data streams, and outputting N/2 second code symbols (Column 12 Lines 34-40).

As discussed above in claim 1, it is desirable that a transmitter encodes a codeword using two encoders (See Yoshida et al., Column 19 Lines 22-24). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to invoke block coding the parallel data streams not subject to the block coding in step (2), as Yoshida et al. teaches, in the method of Kim et al., in order to result in improved error detection.

5) Regarding claim 5:

Kim et al. teaches the method of claim 4, wherein when the transmitting apparatus uses BPSK (Binary Phase Shift Keying), the input operator data streams are determined by the following equations, where k represents a converted data stream (Paragraph 65 Lines 1-3 and Paragraphs 97, 98),

$$\mathbf{k_{2r} = -k_2 \bullet k_r \bullet k_{r+2}}$$

$$\mathbf{k_{2r-i} = k_1 \bullet k_{r-i} \bullet k_{r+1},} \qquad i = 1,\ldots,(r-3)$$

6) Regarding claim 6:

Kim et al. teaches the method of claim 4, wherein when the transmitting apparatus uses QPSK (Quadrature Phase Shift Keying), the input operator data streams are generated by the following equations, where k represents a converted data stream (Paragraph 69 Lines 1-3 and Paragraphs 97, 98),

$$k_{b10} = k_{b1} \bullet k_{b2} \bullet k_{b3} \bullet k_{b4} \bullet k_{b7} \bullet k_{b8} \bullet k_{b9}$$

$$k_{s6} = \mathrm{mod}(\mathrm{mod}(k_{s2} + 1, 2) \times 2 + k_{s2} + k_{s3} + k_{s5}, 4)$$

where mod (x, M) denotes modulo M for x.

7) Regarding claim 7:

Kim et al. teaches a method of reducing the peak-to-average power ratio (PAPR) of a signal transmitted on a plurality of ($N=2^r$) sub-carriers in a transmitting apparatus including a serial to parallel converter (104 in Fig. 1) for converting a serial data in to parallel data streams $k_1, k_2, \ldots, k_{r+2}$, comprising the steps of:

receiving at least one of the parallel data streams and generating at least one operator bit $k_{r+3}, \ldots, k_{2r}$ that renders block coded symbols complementary (Paragraph 8 Lines 7-23, 105 and 106 in Fig. 1, and Paragraph 50 Lines 8-14); and

distributing the parallel data streams and the at least one operator bit equally to the encoders and block coding the distributed data, where t is the number of encoders (Paragraph 21 Lines 8-36, Abstract Lines 2-6, 107 in Fig. 1, and Column 8 Lines 13-19, wherein, the sub-channel mapper is interpreted as the first encoder outputting first code symbols)

Regarding a plurality of encoders:

Kim et al. does not teach, a plurality of encoders for block coding the parallel data streams $k_1, k_2, \ldots, k_{r+2}$ in an orthogonal frequency division multiplexing (OFDM) mobile communication system where r is a natural number more than 2. However, as discussed in claim 1 above, Yoshida et al. teaches, a plurality of encoders for block coding the parallel data streams $k_1, k_2, \ldots, k_{r+2}$ in an orthogonal frequency division multiplexing (OFDM) mobile communication system where r is a natural number more than 2 (Column 12 Lines 34-40 and Fig. 22).

8) Regarding claim 8:

Yoshida et al. further teaches, wherein the number of operator bits is determined as r-2 according to the number of sub-carriers (Column 7 Lines 3-23).

9) Regarding claim 9:

Kim et al. teaches the method of claim 7, wherein when the transmitting apparatus uses BPSK (Binary Phase Shift Keying), the input operator data streams are determined by the following equations, where k represents a converted data stream (Paragraph 65 Lines 1-3 and Paragraphs 97, 98),

$$\mathbf{k_{2r} = -k_2 \bullet k_r \bullet k_{r+2}}$$

$$\mathbf{k_{2r-i} = k_1 \bullet k_{r-i} \bullet k_{r+1},} \qquad i = 1,\ldots,(r-3)$$

10) Regarding claim 10:

Kim et al. teaches the method of claim 7, wherein when the transmitting apparatus uses QPSK (Quadrature Phase Shift Keying), the input operator data

streams are determined by the following equations, where k represents a converted data stream (Paragraph 69 Lines 1-3 and Paragraphs 97, 98),

$$k_{b10} = k_{b1} \bullet k_{b2} \bullet k_{b3} \bullet k_{b4} \bullet k_{b7} \bullet k_{b8} \bullet k_{b9}$$

$$k_{s6} = \mathrm{mod}(\mathrm{mod}(k_{s2} + 1,2) \times 2 + k_{s2} + k_{s3} + k_{s5},4)$$

where mod (x, M) denotes modulo M for x.

11)Regarding claim 11:

Kim et al. discloses an apparatus for reducing the peak-to-average power ratio (PAPR) of a signal transmitted on a plurality of ($N=2^r$) sub-carriers in a transmitting apparatus including a serial to parallel converter (104 in Fig. 1) for converting a serial data in to parallel data streams $k_1, k_2, \ldots, k_{r+2}$ in an orthogonal frequency division multiplexing (OFDM) mobile communication system (Paragraph 50 Lines 1-6 and Abstract Lines 2-12) where r is a natural number more than 2, comprising:

an operator, generator for receiving at least one of the parallel data streams and generating at least one operator bit $k_{r+3}, \ldots, k_{2r}$ that renders block coded symbols complementary (Paragraph 8 Lines 7-23, 105 and 106 in Fig. 1, and Paragraph 50 Lines 8-14).

Kim et al. does not disclose a plurality of encoders, each for receiving an equal number of the parallel data streams and the at least one operator bit $k_{r+3}, \ldots, k_{2r}$ and block coding the received data. However, as discussed in claim 1 above, Yoshida et al. discloses a plurality of encoders, each for receiving an equal number of the parallel data

streams and the at least one operator bit $k_{r+3},\ldots, k_{2r}$ and block coding the received data (Column 12 Lines 34-40).

12)Regarding claim 12:

Yoshida et al. further discloses, wherein the number of operator bits is determined as r-2 according to the number of sub-carriers (Column 7 Lines 3-23).

13)Regarding claim 13:

Kim et al. discloses the apparatus of claim 11, wherein when the transmitting apparatus uses BPSK (Binary Phase Shift Keying), the operator generator determines the input operator data streams by the following equations, where k represents a converted data stream (Paragraph 65 Lines 1-3 and Paragraphs 97, 98),

$$\mathbf{k_{2r} = -k_2 \bullet k_r \bullet k_{r+2}}$$

$$\mathbf{k_{2r-i} = k_1 \bullet k_{r-i} \bullet k_{r+1}}, \qquad i = 1,\ldots,(r-3)$$

14)Regarding claim 14:

Kim et al. discloses the apparatus of claim 11, wherein when the transmitting apparatus uses QPSK (Quadrature Phase Shift Keying), the operator generator determines the input operator data streams by the following equations, where k represents a converted data stream (Paragraph 69 Lines 1-3 and Paragraphs 97, 98),

$$\mathbf{k_{b10} = k_{b1} \bullet k_{b2} \bullet k_{b3} \bullet k_{b4} \bullet k_{b7} \bullet k_{b8} \bullet k_{b9}}$$

$$\mathbf{k_{s6} = mod(mod(k_{s2} +1,2) \times 2+ k_{s2} + k_{s3} + k_{s5},4)}$$

where mod (x, M) denotes modulo M for x.

15) Regarding claim 15:

Kim et al. teaches a method of demodulating decoded data streams $k_1, k_2, \ldots, k_{2r}$ in a receiving apparatus that converts a serial input signal into parallel data streams where r is a natural number more than 2, Fourier-transforming the parallel data streams (Paragraph 105 Lines 1-22, 1613 in Fig. 16, Paragraph 61 Lines 9-11, and Paragraph 67 Lines 10-11), comprising the steps of:

identifying at least one operator bit $k_{r+3}, \ldots, k_{2r}$ from the decoded data streams (Paragraph 106 Lines 6-17);

removing the at least one operator bit from the decoded data streams (Paragraph 106 Lines 6-17); and

recovering source data from information data streams $k_1, k_2, \ldots, k_{r+2}$ free of the at least one operator bit (Paragraph 109 Lines 29-32).

Regarding a plurality of decoders:

Kim et al. does not teach, distributing the Fourier-transformed data equally to a plurality of decoders in an orthogonal frequency division multiplexing (OFDM) mobile communication system. However, Yoshida et al. teaches, distributing the Fourier-transformed data equally to a plurality of decoders in an orthogonal frequency division multiplexing (OFDM) mobile communication system (Column 13 Lines 42-45 and Fig. 22).

As discussed in claim 1 above, it is desirable that a transmitting apparatus for reducing PAPR encodes a codeword using a plurality of encoders. For proper decoding, use of a plurality of encoders at the transmitter side necessitates the use of a

plurality of decoders at the receiver side. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a plurality of decoders, as Yoshida et al. teaches, in the demodulating method of Kim et al., in order to result in improved error detection.

16)Regarding claim 16:

Yoshida et al. further teaches, wherein the number of operator bits is determined as r-2 according to the number of sub-carriers used in a transmitting apparatus (Column 7 Lines 3-23).

17)Regarding claim 17:

Kim et al. discloses an apparatus for demodulating decoded data streams k_1, $k_2, \ldots, k_{2r}$ in a receiving apparatus including a serial to parallel converter for converting a serial input signal in to parallel data streams where r is a natural number more than 2, and a Fourier transformer for Fourier-transforming the parallel data streams in an orthogonal frequency division multiplexing (OFDM) mobile communication system (Paragraph 105 Lines 1-22, 1613 in Fig. 16, Paragraph 61 Lines 8-11, and Paragraph 67 Lines 10-11), comprising:

an operator remover for identifying at least one operator bit $k_{r+3}, \ldots, k_{2r}$ from the decoded data streams and removing the at least one operator bit from the decoded data streams (Paragraph 106 Lines 6-17);

a demapper for recovering source data from information data streams $k_1, k_2, \ldots, k_{r+2}$ free of the at least one operator bit (Paragraph 109 Lines 29-32 and Paragraph 50 Lines 8-14).

Kim et al. does not disclose, a plurality of decoders, each for receiving an equal number of Fourier-transformed complementary sequences and decoding the received complementary sequences. However, as discussed in claim 15, Yoshida et al. disclose, a plurality of decoders, each for receiving an equal number of Fourier-transformed complementary sequences and decoding the received complementary sequences (Column 13 Lines 42-45, Fig. 22).

18)Regarding claim 18:

Yoshida et al. further discloses, wherein the number of operator bits is determined as r-2 according to the number of sub-carriers used in a transmitting apparatus (Column 7 Lines 3-23).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Shattil (US Pub 2003/0147655) teaches a multi-carrier method designed for mobile communications that accomplishes control of interference between the sub-carriers.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mohsin (Ben) Benghuzzi whose telephone number is (571) 270-1075. The examiner can normally be reached Monday through Friday, 8:30am- 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

9. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Mohsin (Ben) Benghuzzi

October 31, 2006

M. G

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER